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Mathematics, since it admittedly gives us certain knowledge, must disclose the clue to this method. Here we find only two conditions under which certainty is found, intuition and deduction, both of which, however, ultimately reduce to one, *viz.,* intuition. Intuition is not imagination or perception, but rational insight into the nature of an object immediately apprehended as simple and distinct. Hence the object is either apprehended truly, or not at all; error is excluded. Deduction presupposes an intuition, from which it passes immediately and by necessity to another term. It is the process by which the mind makes knowledge whose certainty is not in itself evident, to rest upon self-evident truth. Deduction is in a sense only intuition, but it requires a *movement* of the mind from one term to another, and can thus only exist by the aid of memory. It consists, not in the intuition of a second term, but in the intuition of a relation as making this second term necessarily dependent on the first, as in the case of an arithmetical progression. According to the usually accepted theory of the judgment, it simply renders explicit a preexistent but implicit relation between preexistent terms. But according to Descartes's theory of the judgment, it is a process of *deriving* a second term by means of a relation. The relation determines the succeeding terms, not the terms the relation. In Descartes the judgment is an act of constitutive thought, first by intuition positing a first term, and then by means of a relation giving this first term a complement, or a series of complements, which without the act of judgment would not exist. It is not the syllogism, but the judgment as thus defined, which constitutes the essence of thought.

Mathematical deduction is never syllogistic. Only two concepts are basal in mathematics, order and magnitude. Order requires no middle term for its derivation, since each element follows immediately upon its predecessor. And magnitude, while it requires for its expression a unit, which appears to be a third or middle term, nevertheless presents but a superficial similarity to the syllogistic process. The syllogistic middle is always a species, the mathematical unit is never a species. Descartes has thus hurled King Syllogism from his usurper's throne in the realm of knowledge, and made way instead for the rightful heir and claimant, mathematical induction.

The article, of which I have in the above attempted to give a summary, is written in a vivacious and lucid style. A criticism of its content would be a criticism of Descartes, and quite out of place in this review of a fragment published as a memorial.

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*Die Bedeutung der nichteuklidischen Geometrie in ihrem Verhältniss zu Kant's Theorie der mathematischen Erkenntniss.* W. MEINECKE. *Kantstudien,* June, 1906. Pp. 209–232.

The impossibility of proving the parallel axiom was the starting-point of the so-called non-Euclidean geometry. Lobachevski's method of supposing that this axiom is false leads to sets of theorems which are contradictionless among themselves, though widely different from the theorems of ordinary geometry. These different systems are characterized by certain constants which are of the dimensions of a distance. Lobachevski tried to determine this constant for empirical space by measuring the parallax of Sirius and he found that triangles, the sides of which are of the order of magnitude of the radius of the orbit of the earth, do not show an appreciable difference from the triangles of Euclidean geometry. Geometry, then, is based on experience and its theorems have only comparative generality.

Against this argumentation Meinecke raises the question: How is it possible that sciences, which use mathematics as their basis, can support the validity of mathematical propositions? Their validity can be demonstrated only by an epistemological inquiry into the origin of mathematical knowledge. Such an inquiry seems the more important in view of the fact that the different systems of geometry, which were stated recently, apparently do not show a systematic order of their axioms. If we abstract from our ideas everything that corresponds to sensation, there remains time and space which are the forms of pure sensitivity. Kant proves their apriority by the impossibility of getting an intuition of other spatial or temporal forms, but Helmholtz holds that one actually may acquire the intuition of other spaces. The view of a non-Euclidean space, as described by Helmholtz, is nothing but Beltrami's representation of non-Euclidean in Euclidean space. The author tells from his own experience that he too believes he has the non-Euclidean space intuition, but whenever he tries to bring the object of his imagination into the focus of his attention, so as to see the hyperbolic parallels approach asymptotically, he was prevented from doing so by a feeling of dizziness similar to that which we have in dreams when we stand at the edge of a precipice. Of all the geometries there is only one, the Euclidean, which is real.

Philosophy of mathematics may start from Kant, but it must go beyond Kant. At first the rule must be stated that mathematics must not contradict logic, and since time and space are the objects of mathematics, one obtains the definition: Mathematics is the application of the logical calculus to the forms of pure intuition. The theorems of mathematics are *a priori* valid because mathematics deals with the pure forms of intuition. There are two branches of mathematics—analysis and geometry—corresponding to the two forms of pure intuition. Analysis is built on the notion of number. This notion is produced by the successive synthesis of the unit in time. The author finds at this point an obscurity in Kant's theory, which, however, does not impair its validity. Geometry is obtained by a further reduction of the logical possibilities, subjecting the conclusions to the conditions of space. The fact that the perception of space indirectly depends on the perception of time, explains why geometry never contradicts and never can contradict the results of calculus. It also answers Lucka's question why it is possible to apply analysis to space. From this follows that there is among the axioms of geometry one which implies a temporal relation. The author comes to the conclusion that Kant's theory of time and space can explain the entire system of axioms which are the foundations of geometry, and that it shows also the possibility of non-Euclidean geometry as a part of the system. It may be required to deduce the axioms of geometry from the forms of space intuition. F. M. URBAN.

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## JOURNALS AND NEW BOOKS

REVUE PHILOSOPHIQUE. April, 1907. *Anarchisme et individualisme: Essai de psychologie sociale* (pp. 337–365): G. PALANTE. – The terms anarchism and individualism are usually confused. The former denotes a social system or economic doctrine which is moralistic, idealistic and optimistic; the latter an intellectual or sentimental attitude of an individual toward society; it is pessimistic, anti-dogmatic and disinclined to proselytism. At present anarchism seems to be dissolving into various forms of socialism. Individualism has a perennial character for psychological reasons, and will remain an indestructible form of human sensibility. *De l'esprit magique à l'esprit scientifique* (conclusion) (pp. 366–382): J. SAGERET. – The magic spirit survives in our day in religion, mysticism and poetry. It is opposed to the scientific spirit through its subjective character and corresponds to a logic of feelings, as opposed to ordinary logic. The scientific spirit is objective, amoral and 'asocial.' *La transformation des idées et le public* (pp. 383–408): A. BAUER. – The author traces certain transformations of fundamental ideas in esthetics, ethics, religion, philosophy and law. The innovations take hold and give rise to antinomies through certain dispositions of the public sentiment with which they agree. *Revue critique: The origin and development of moral ideas, d'après Westermarck:* P. FAUCONNET. *Analyses et comptes rendus.* Prudhomme, *Psychologie du libre arbitre:* L. DUGAS. *Studies in Philosophy and Psychology* (by former students of Charles Garman): G. Bos. Della Valle, *La psicogenesi della coscienza:* J. SEGOND. Elie Blanc, *Dictionnaire de philosophie ancienne, moderne et contemporaine:* ANDRÉ LALANDE. Tönnies, *Philosophische Terminologie in Psychologisch-Soziologischer Ansicht:* LALANDE. Grasset, *Demifous et demiresponsables:* G. L. DUPRAT. Moutin, *Le magnétisme humain:* DUPRAT. Masselon, *La mélancholie:* PH. CHASLIN. Francillon, *Essai sur la puberté chez la femme:* CHASLIN. Blondel, *Les automutilateurs:* H. WALLON. Senet, *Patologia del instinto de conservacion:* F. PÉRÈS. *Revue des périodiques étrangers.*

REVUE DE MÉTAPHYSIQUE ET DE MORALE. March, 1907. *Comment se pose le problème de Dieu* (pp. 129–170): E. LE ROY. – The proofs derived from the physical world for the most part are traced to